Karlsruhe Institute of Technology

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(SyncTech)

Collaborative Financial Analysis using Semantic MediaWiki

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SMWCon Fall 2012, Cologne, Germany, October 25, 2012

Institute of Applied Informatics and Formal Description Methods (AIFB)

LS3 FINANCE
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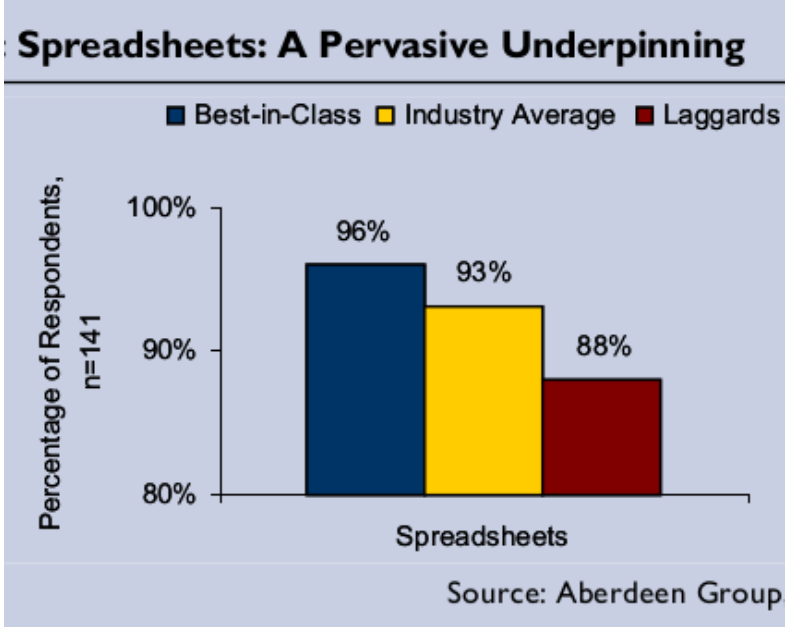
SMW
Semantic MediaWiki

Motivation



- Good companies use for analysing financial data [1]
  - Data Warehouse + ETL pipeline
  - Excel spreadsheets
- Collaborative financial analysis difficult
  - Discussion of financial reports done detached per PowerPoint, mail
  - Changes to planning done without annotating the rationale
- Collaboration crucial
  - Lessons learned for later situations
  - Rationale are retained for later reproduction by others

Problems

- Can Semantic MediaWiki replace common Data Warehousing and Excel spreadsheet analysis?

- Can Semantic MediaWiki allow collaborative decision making on financial data?

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Case Study: Semantic MediaWiki for ls3finance

LS3FINANCE
ls3finance@aifb.uni-karlsruhe.de

- ls3finance
  - **3 people** responsible for management of third-party funding at research group of around **30 people**
- Data sources
  - Metadata about personell, projects etc. (Excel, SVN)
  - Planning of expenses and budget (Excel, SVN)
  - Accounting transactions (University Data Warehouse)
- Tasks
  - Daily creation and editing of expense and budget plans
  - Monthly import and check of accounting transactions
  - Collaboration crucial

Is3finance: Requirements

- Spreadsheet analyses
  - Overviews of people, projects etc.
  - Pivot analyses – Comparison of budget planning, expense planning and accounting transactions
  - Personell table – Overview of project allocation per project/person

- Collaboration
  - Flexible annotation and commenting
  - Synchronous editing, reproducible editing
  - Security

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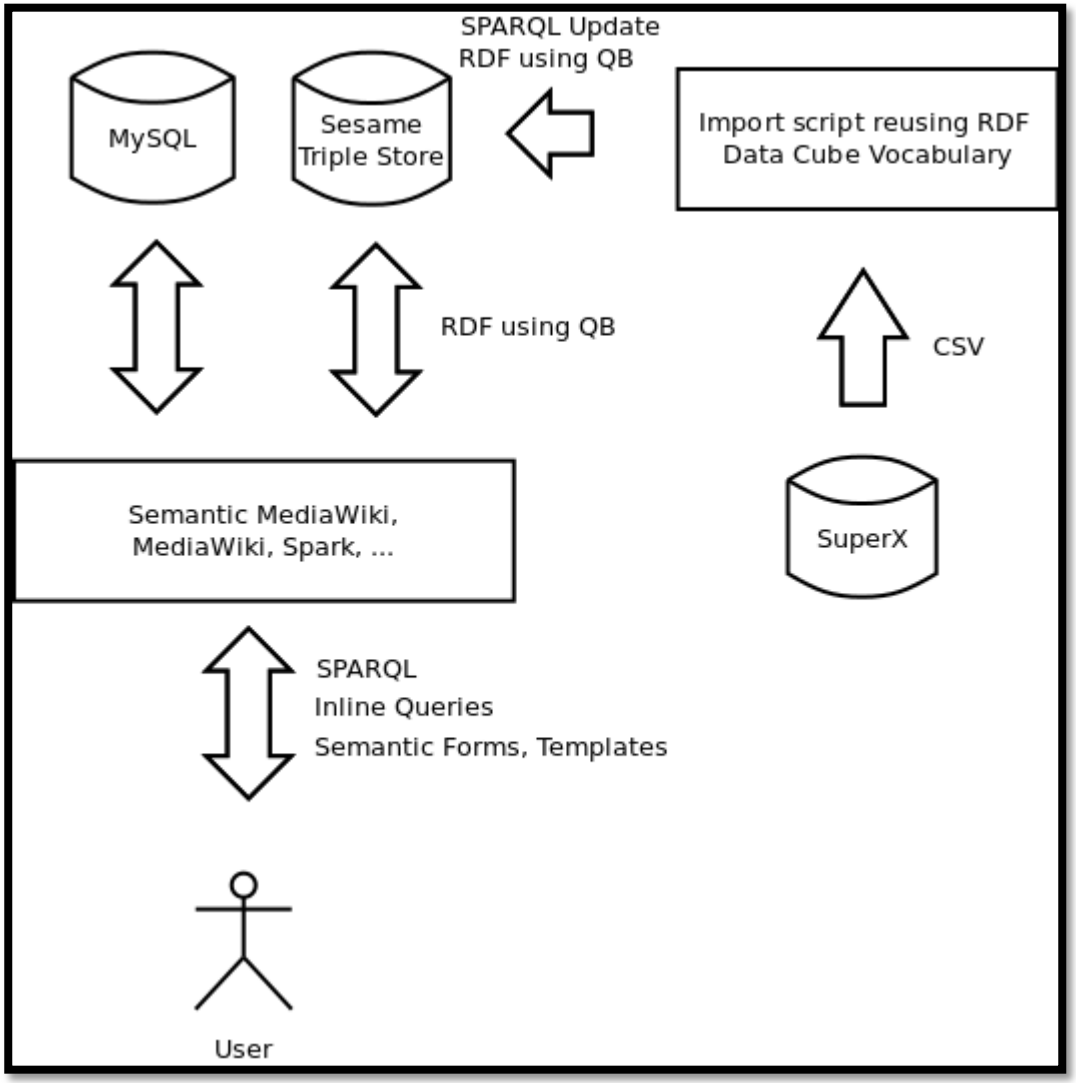
Architecture



Input:

- Semantic Forms
- Import script

Output:

- Inline Queries
- Result Formats for visualisations
- Spark [2] for SPARQL queries and visualisations

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Expense and Budget Plans

- Person
- Project
- Personell plan
- **Travel plan**
- ...

Reiseplanung bearbeiten: TravelPlanning 2008-09-16 6 - Finance Wiki - Mozilla Firefox

SMWcon Fall ... | Institut AIFB ... | Collaborativ... | SMWCon Fall... | SMWCon Fall... | OpenRDF Wo...

localhost/F-Wiki/index.php?title=TravelPlanning_2008-09-16_6&action=formedit

Page | Discussion

Reiseplanung bearbeiten: TravelPlanning 2008-09-1

Navigation

Main page
Community portal
Current events
Recent changes
Random page
Help

Toolbox

DepartureDate: 16 September 2008
Traveler: person_b447de30800327fda57f3
Project: project_2d5207a56bed1f64082f
Amount: -123
Reason: Projektmeeting
Comment: Info von X.
Free text:

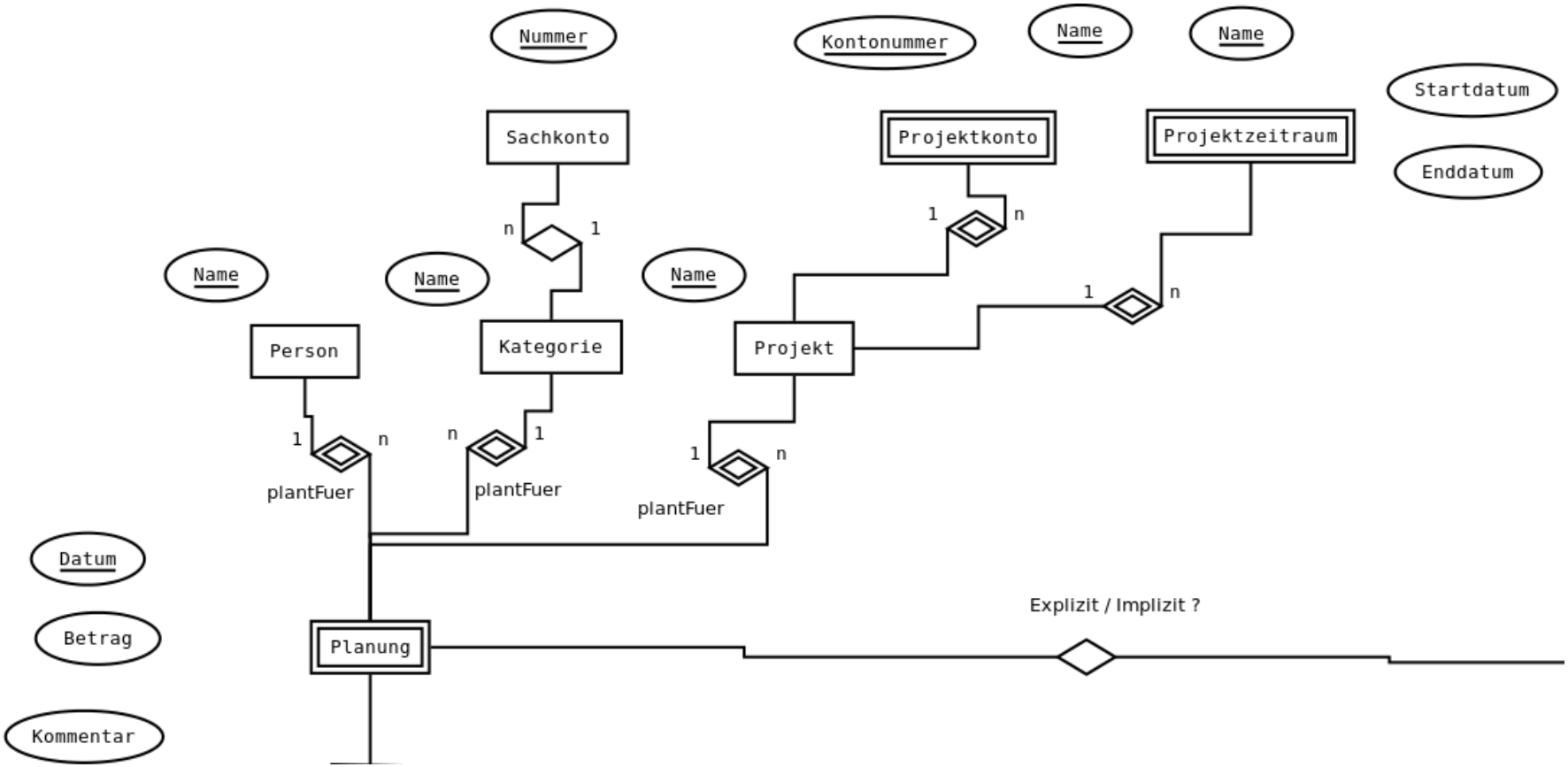
Timeline

009-02-25 TravelPlanning 2009-03-13 TravelPlanning 2009-03-31 TravelPlanning 2009-04-17 TravelPla
009-02-25 TravelPlanning 2009-03-13 TravelPlanning 2009-03-31 TravelPlanning 2009-04-17 Trav
TravelPlanning 2009-03-07 TravelPlanning 2009-03-25 TravelPlanning 2009-04-20 Trav
TravelPlanning 2009-03-11 TravelPlanning 2009-04-03 TravelPlanning 2009-04-21 Trav
TravelPlanning 2009-03-11 TravelPlanning 2009-04-24
TravelPlanning 2009-03-11 TravelPlanning 2009-04-26
2009-02-26 Mar 1 TravelPlanning 2009-03-18 Mar 29 Apr 5 Apr 12 Apr 19 TravelPlanning 2009-04-26

Oct Nov Dec 2009 Feb Mar Apr May Jun Jul

eline © SIMILE

Expense and Budget Plans – Linking entities



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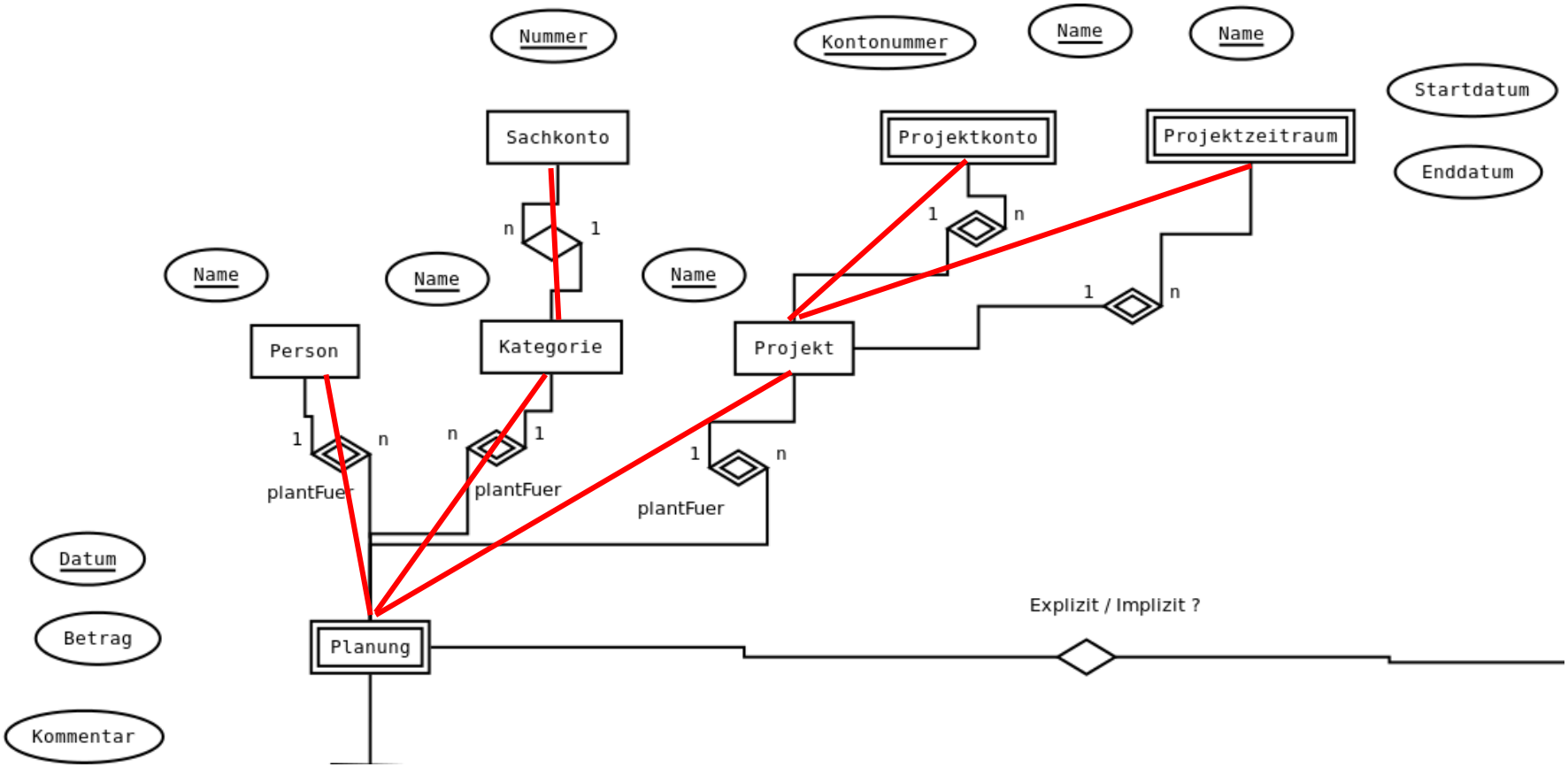
Expense and Budget Plans – Linking entities



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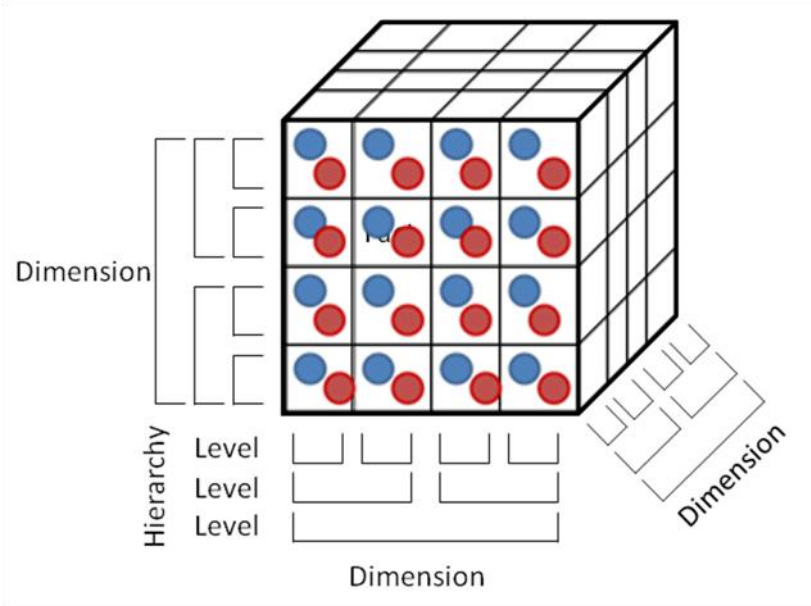
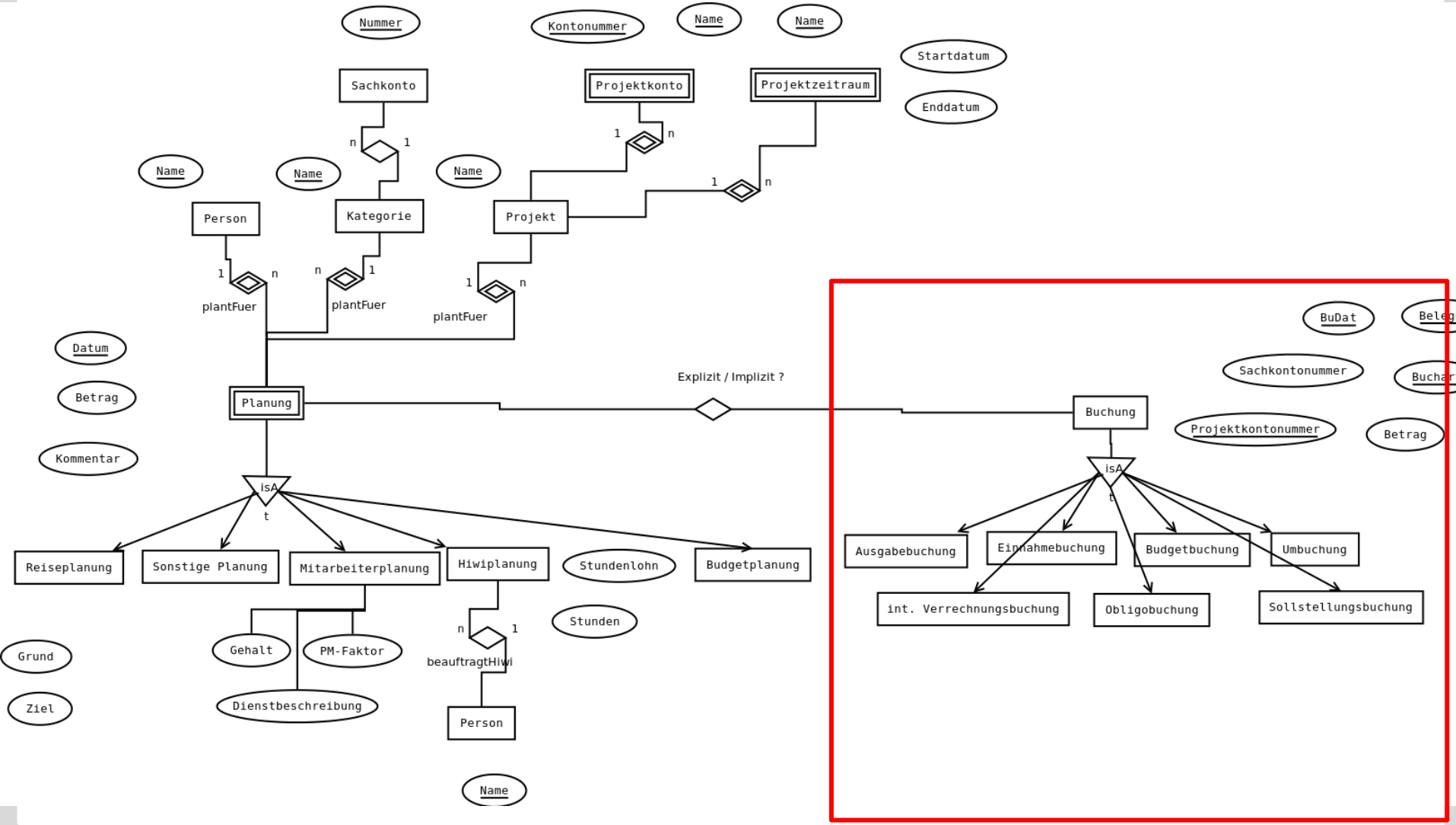
Expense and Budget Plans – Modelling and Querying Statistics

- Data Cube with
  - Account transactions (planned)
- Dimensions
  - Project
  - Person
  - Date
  - Type (expense, budget,...)
  - Finance category
- Measures
  - Sum of amount



Import and reuse of RDF Data Cube Vocabulary
http://www.w3.org/TR/vocab-data-cube/

Monthly Import and Check of Accounting Transactions



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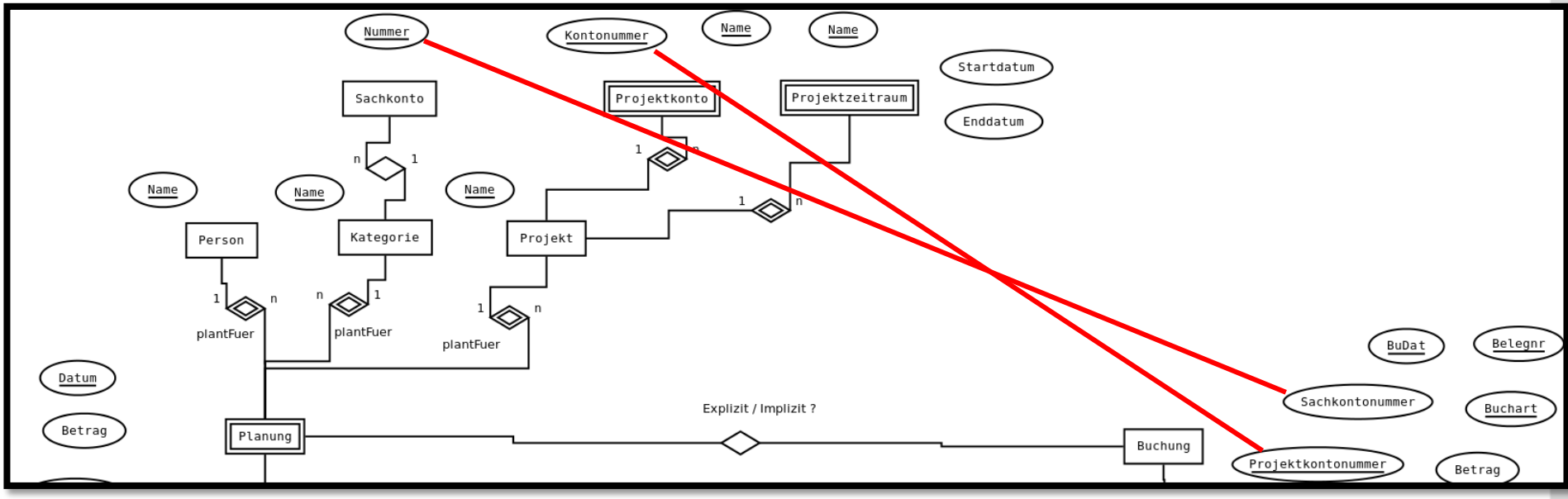
Monthly Import and Check of Accounting Transactions (2)

- Implicit link between plans and accounting transactions
- Explicit links through helper entities and properties (e.g., project through project account)



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Monthly Import and Check of Accounting Transactions (3)

- Import script reusing RDF Data Cube Vocabulary
- Adding accounting transactions to Data Cube
- Preprocessing using construct queries
- Simultaneous querying of transactions from SMW and from Data Warehouse

t Planungen und Buchungen - Finance Wiki - Mozilla Firefox

Institut AIFB ... | Collaborativ... | SMWCon Fall... | SMWCon Fall... | OpenRD

F-Wiki/index.php/Übersicht_Planungen_und_Buchungen

MiscPlanning 45

BudgetPlanning 142

Cube

Property	Anzahl	Anzahl mittels SPARQL
Category:Qb:Observation	3442	count 9431
Property:Qb:dataSet	3442	count 9431
Property:CubeDefinition/Dimension/category	3442	count 8903
Property:CubeDefinition/Dimension/type	3443	count 9432
Property:CubeDefinition/Dimension/date	3442	count 9430
Property:CubeDefinition/Dimension/project	3442	count 9405
Property:CubeDefinition/Dimension/person	3300	count 3300
Property:CubeDefinition/Measure/amount	3442	count 9431

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Property:CubeDefinition/Dimension/project	3442	count 9405
Property:CubeDefinition/Dimension/person	3300	count 3300
Property:CubeDefinition/Measure/amount	3442	count 9431

Pivot analyses

- Comparison of budget planning, expense planning and accounting transactions

Aggregate function: SUM

Subtotals aggregate function: COUNT

Filter list

obs: [all] X

C: http://wiki2.local/F-Wiki/index.php/Special:URIResolver/Project_4fa621c3f261a84e1e520a29c41c2a3d X

D: [all] X

E	B	BudgetPlanning	HiwiPlanning	PersonellPlanning	TravelPlanning	expense	B
A							
http://wiki2.local/F-Wiki/index.php/Special:URIResolver/HiWis		9600.00	-946.92	0.00	0.00	-972.21	
http://wiki2.local/F-Wiki/index.php/Special:URIResolver/Reise		0.00	0.00	0.00	-1354.00	0.00	
http://wiki2.local/F-Wiki/index.php/Special:URIResolver/Entgeltgruppe_E12-2DE15		60000.00	0.00	-66000.00	0.00	-55698.39	
http://wiki2.local/F-Wiki/index.php/Special:URIResolver/Inland_Reise		0.00	0.00	0.00	0.00	-74.30	
http://wiki2.local/F-Wiki/index.php/Special:URIResolver/Ausland_Reise		0.00	0.00	0.00	0.00	-53.00	
http://wiki2.local/F-Wiki/index.php/Special:URIResolver/Wiss._HiWis		0.00	0.00	0.00	0.00	-1761.10	
http://wiki2.local/F-Wiki/index.php/Special:URIResolver/Stud._HiWis		0.00	0.00	0.00	0.00	-2940.39	
A							

Show chart

Man will normalerweise Ausgabe-Planungen, Budget-Planungen und Buchungen miteinander vergleichen. Ausgabe-Planungen sind jedoch noch einmal unterteilt in Hiwi-Planungen etc. M gruppieren können.

PersonalReport

Spark with OAT-Pivot visualisation

Pivot analyses

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Aggregate function: SUM

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D: [all]

E	B	BudgetPlanning	HiwiPlanning	PersonellPlanning	TravelPlanning	expense	B
A							
http://wiki2.local/F-Wiki/index.php/Special:URIResolver/HiWis		9600.00	-946.92	0.00	0.00	-972.21	
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http://wiki2.local/F-Wiki/index.php/Special:URIResolver/Entgeltgruppe_E12-2DE15		60000.00	0.00	-66000.00	0.00	-55698.39	
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http://wiki2.local/F-Wiki/index.php/Special:URIResolver/Ausland_Reise		0.00	0.00	0.00	0.00	-53.00	
http://wiki2.local/F-Wiki/index.php/Special:URIResolver/Wiss._HiWis		0.00	0.00	0.00	0.00	-1761.10	
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Personell table

Per project

A: [all]

C: http://wiki2.local/F-Wiki/index.php/Special:URIResolver/Project_530e4f277e1c1c3c3df918a5445af9b7

E	D	2012-05-01Z	2012-06-01Z	2012-07-01Z	2012-08-01Z	2012-09-01Z	2012-10-01Z	2012-1
B								
http://wiki2.local/F-Wiki/index.php /Special:URIResolver /Person_a3be75100faaeaa71395b5efe84205df		0.00	1.00	1.00	1.00	1.00	0.00	
http://wiki2.local/F-Wiki/index.php /Special:URIResolver /Person_77ede392671a4fe4901dfb10151228bf		1.00	1.00	1.00	1.00	1.00	1.00	
B								

Per person

A: [all]

B: http://wiki2.local/F-Wiki/index.php/Special:URIResolver/Person_65f01d9bb57bf762df4dd93150d6a991

E	D	2009-09-01Z	2009-10-01Z	2009-11-01Z	2009-12-01Z	2010-01-01Z	2010-02-01Z	2010-03-01Z	2010-04-01Z	2010-05-01Z	2010-06-01
C											
http://wiki2.local/F-Wiki/index.php /Special:URIResolver /Project_ba29657a6f2b3766d79f7c89e9422d12		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
http://wiki2.local/F-Wiki/index.php /Special:URIResolver /Project_83a9f6e35d8a79067d2237f75497b5f3		1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.0
http://wiki2.local/F-Wiki/index.php /Special:URIResolver /Project_88ee718e55e1feebd318a80b77060f21		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
http://wiki2.local/F-Wiki/index.php /Special:URIResolver /Project_0485bca66c47cbf84bd898544a46b7da		0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.0
C											

Personell table

Per project

A: [all]

C: http://wiki2.local/F-Wiki/index.php/Special:URIResolver/Project_530e4f277e1c1c3c3df918a5445af9b7

E	D	2012-05-01Z	2012-06-01Z	2012-07-01Z	2012-08-01Z	2012-09-01Z	2012-10-01Z	2012-1
B								
http://wiki2.local/F-Wiki/index.php /Special:URIResolver /Person_a3be75100faaeaa71395b5efe84205df		0.00	1.00	1.00	1.00	1.00	0.00	
http://wiki2.local/F-Wiki/index.php /Special:URIResolver /Person_77ede392671a4fe4901dfb10151228bf		1.00	1.00	1.00	1.00	1.00	1.00	
B								

Per person

A: [all]

B: http://wiki2.local/F-Wiki/index.php/Special:URIResolver/Person_65f01d9bb57bf762df4dd93150d6a991

E	D	2009-09-01Z	2009-10-01Z	2009-11-01Z	2009-12-01Z	2010-01-01Z	2010-02-01Z	2010-03-01Z	2010-04-01Z	2010-05-01Z	2010-06-01
C											
http://wiki2.local/F-Wiki/index.php /Special:URIResolver /Project_ba29657a6f2b3766d79f7c89e9422d12		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
http://wiki2.local/F-Wiki/index.php /Special:URIResolver /Project_83a9f6e35d8a79067d2237f75497b5f3		1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.0
http://wiki2.local/F-Wiki/index.php /Special:URIResolver /Project_88ee718e55e1feebd318a80b77060f21		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
http://wiki2.local/F-Wiki/index.php /Special:URIResolver /Project_0485bca66c47cbf84bd898544a46b7da		0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.0
C											

Lessons Learned

- Maintainability: e.g., Spark + Sesame (CORS, JSON)

- Query capabilities, e.g., flexible SPARQL 1.1 queries
- Performance, e.g., import of 6,011 transactions takes only couple of minutes
- Agility, e.g., adding constant factor to all plans through template
- Robustness, e.g., red links for wrongly spelled projects

Outlook

- Evaluation of applicability at ls3finance
  - Spreadsheet analysis capabilities
    - e.g., who is underestimating their travel costs?
  - Collaboration capabilities
    - e.g., discussion through comments and talk pages
    - e.g., recent changes to keep up to date
- Extend current pivot functionality to interactive OLAP interface (e.g., with hierarchies)

Conclusions

- Semantic MediaWiki can be used for spreadsheet analysis
  - e.g., overview tables, pivot tables, diagrams
- Lessons learned not only relevant in financial domain
  - e.g., data integration, performance, agility, robustness
- Collaborative analysis capabilities promising but yet to be demonstrated
  - e.g., discussions, synchronous editing

Thanks for your feedback and questions

Cube

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Property:Qb:dataSet	3442	count 9431
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al:URIResolver/Reise		0.00	0.00	0.00		
lver/Entgeltgruppe_E12-2DE15		60000.00	0.00	-66000.00		
RIResolver/Inland_Reise		0.00	0.00	0.00		
RIResolver/Ausland_Reise		0.00	0.00	0.00		
URIResolver/Wiss._HiWis		0.00	0.00	0.00		
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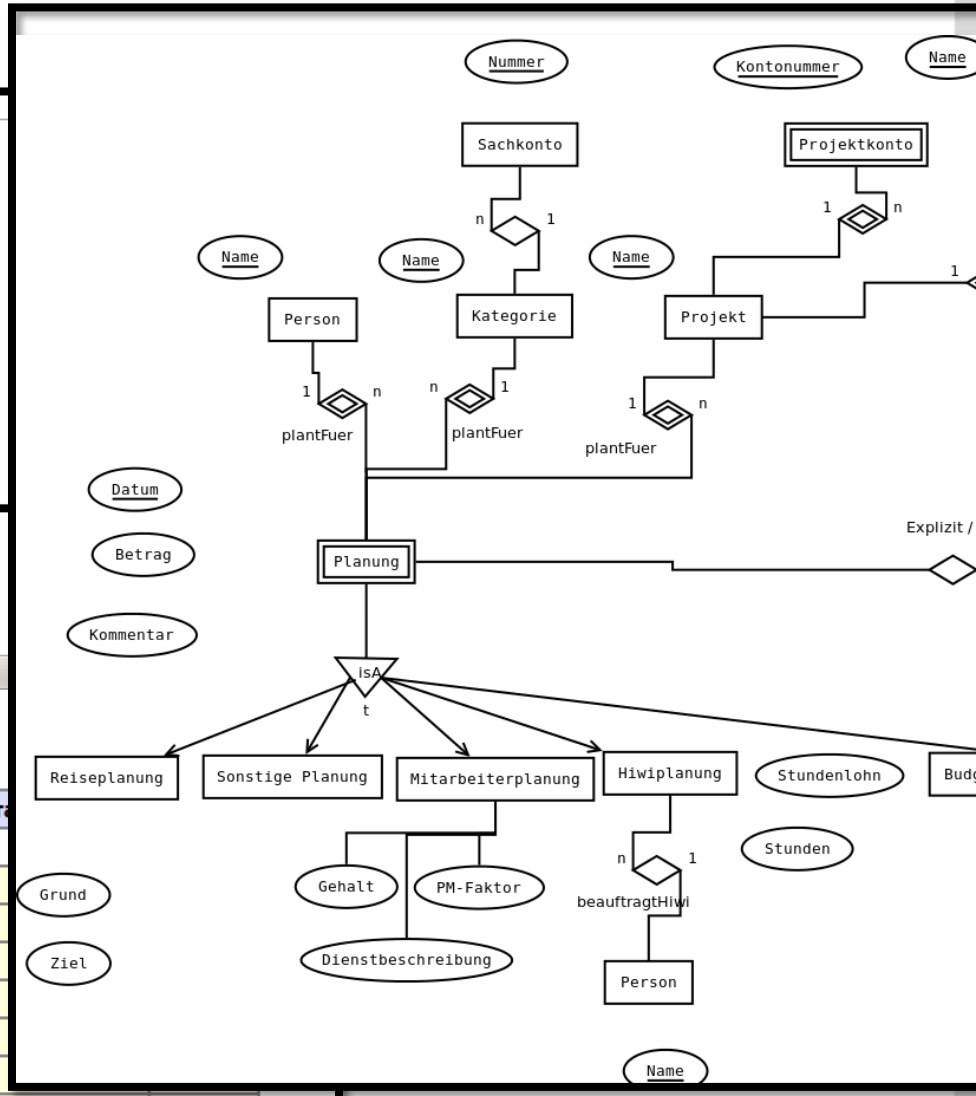

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References

- [1] http://dssresources.com/papers/features/castellina&hkkatch/CFO_IXN_Shared%20Research_No2_Financial,%20Planning,%20Budgeting%20and%20Forecasting%20in%20the%20New%20Economy_Aberdeen,Mar%202011.pdf
- [2] http://km.aifb.kit.edu/sites/spark/